

WHAT IS CLAIMED IS:

1                   1.       A method of detecting the presence of at least one target nucleic acid  
2 sequence in a sample, said method comprising:  
3                   labeling at least one target nucleic acid sequence with at least one quantum  
4 dot; and  
5                   detecting the labeled target nucleic acid sequence by detecting fluorescence  
6 emitted by the at least one quantum dot, wherein the detection of fluorescence in the sample  
7 indicates the presence of at least one target nucleic acid sequence.

1                   2.       The method as in claim 1, further comprising quantitating the target  
2 nucleic acid sequence by analyzing the detected emitted fluorescence.

1                   3.       The method as in claim 1, further comprising transcribing the target  
2 nucleic acid sequence.

1                   4.       The method as in claim 3, wherein the target nucleic acid sequence  
2 comprises DNA and transcribing comprises using a primer which anneals to a conserved  
3 region of the DNA and transcribes a polymorphic region of the DNA when extended.

1                   5.       The method as in claim 4, wherein the primer comprises a biotinylated  
2 primer and the transcribing step produces biotinylated DNA.

1                   6.       The method as in claim 3, further comprising binding the transcribed  
2 target nucleic acid sequence to a substrate.

1                   7.       The method as in claim 6, wherein the substrate comprises a  
2 streptavidin coated surface, support, plate or slide.

1                   8.       The method as in claim 6, further comprising removing unbound  
2 portions of target nucleic acid sequence.

1                   9.       The method as in claim 6, further comprising probing the bound target  
2 nucleic acid sequence using a sequence-tagged hybridization probe.

1                   10.      The method as in claim 9, wherein the target comprises DNA having at  
2 least one point mutation and the probing comprises binding the probe to said at least one  
3 point mutation of the DNA.

11. The method as in claim 9, wherein the target comprises wild type DNA and the probing comprises binding the probe to the wild type DNA.

12. The method as in claim 9, further comprising removing non-specifically bound probe.

13. The method as in claim 9, wherein each quantum dot has an attached oligonucleotide tag and labeling comprises binding each tag with a complementary sequence of each sequence-tagged hybridization probe.

14. The method as in claim 13, further comprising removing unbound quantum dots.

15. The method as in claim 13, wherein detecting comprises scanning the substrate with resolution capable of detecting fluorescence emitted by single quantum dots.

16. The method as in claim 15, further comprising quantitating the target nucleic acid sequence by analyzing the detected emitted fluorescence, wherein analyzing comprises counting the number of quantum dots within an area of scanned substrate.

17. A method of detecting the presence of at least one target nucleic acid sequence in a sample, said method comprising:

labeling at least one target nucleic acid sequence with at least one quantum dot;

detecting the labeled target nucleic acid sequence by detecting fluorescence emitted by the at least one quantum dot, wherein the detection of fluorescence in the sample indicates the presence of at least one target nucleic acid sequence; and

quantitating the target nucleic acid sequence by analyzing the detected emitted fluorescence.

18. A method of detecting the presence of a target nucleic acid sequence in a sample, said method comprising:

transcribing a target nucleic acid sequence using a primer that is complementary to a portion of said target nucleic acid sequence and that comprises an immobilizable label to form an immobilizable target nucleic acid sequence;

6                   immobilizing said immobilizable target nucleic acid sequence on a solid  
7 support to form an immobilized target nucleic acid sequence;  
8                   probing said immobilized target nucleic acid sequence using a sequence-  
9 tagged hybridization probe, wherein said sequence-tagged hybridization probe is  
10 complementary to a portion of said target nucleic acid sequence;  
11                   labeling said immobilized target sequence with a quantum dot conjugate,  
12 wherein said quantum dot conjugate comprises a quantum dot and a nucleic acid sequence  
13 that is complementary to a portion of said sequence-tagged hybridization probe; and  
14                   detecting the labeled immobilized target nucleic acid sequence by detecting  
15 fluorescence emitted by said quantum dot, wherein the detection of fluorescence in said  
16 sample indicates the presence of said target nucleic acid sequence.